

**ABSTRACT**

A method of etching a substrate includes placing a substrate in a process zone. The substrate has a material with a thickness, and the material has exposed regions between features of a patterned mask. An etchant gas is introduced into the process zone. The etchant gas is energized to etch the material. An endpoint of etching the material of the substrate is determined by (i) reflecting a light beam from the substrate, the light beam having a wavelength selected to have a coherence length in the substrate of from about 1.5 to about 4 times the thickness of the material, and (ii) detecting the reflected light beam to determine an endpoint of the substrate etching process. Additionally, the wavelength of the light beam can be selected to maximize an absorption differential that is a difference between the absorption of the light beam in the patterned mask and the absorption of the light beam in the material.